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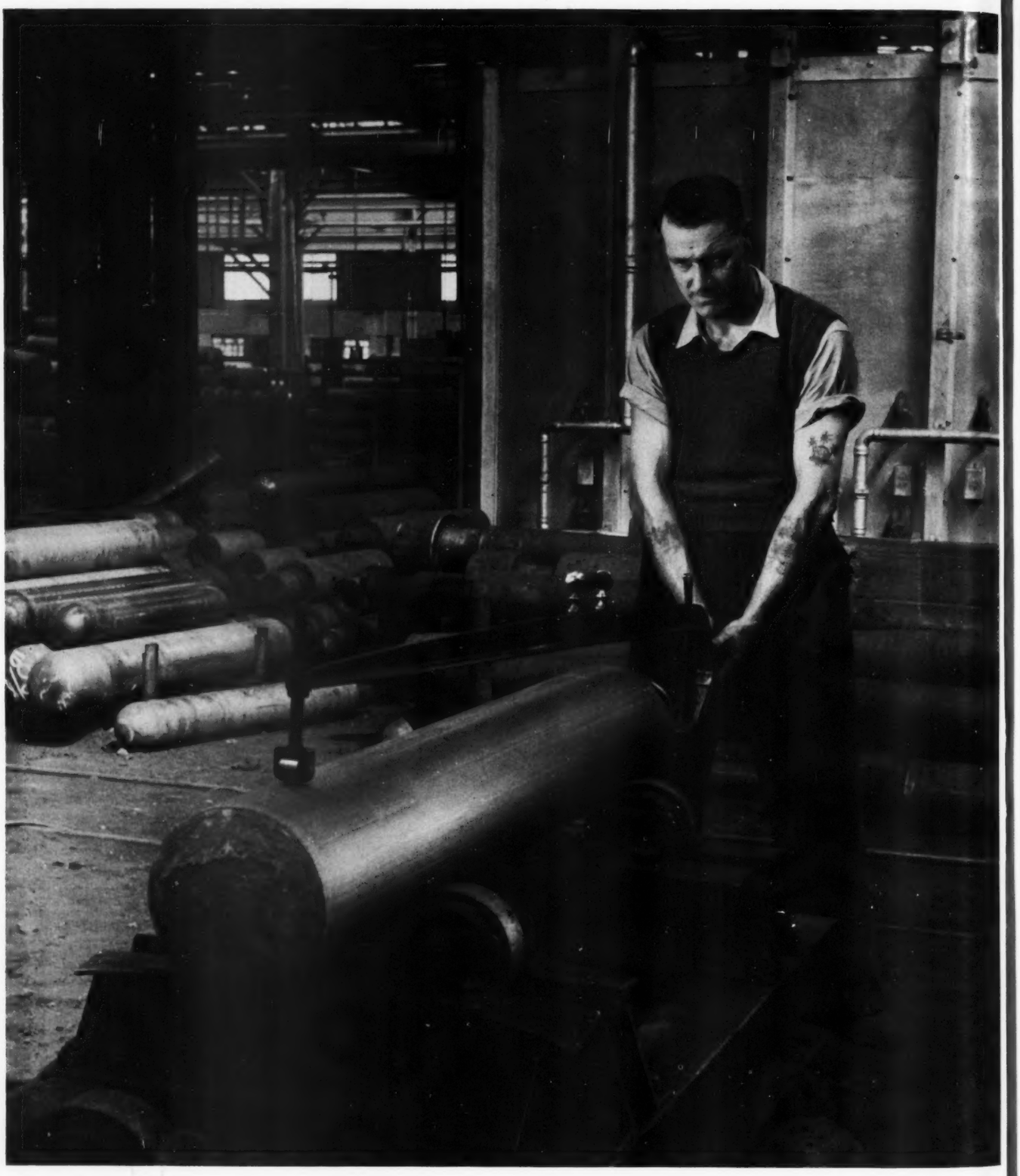

CYLINDER-WALL THICKNESS GAUGING

Stages in the manufacture of steel tubes and cylinders for the transport and storage of compressed industrial gases have been shown in two pictures in a previous volume. The first stage was the piercing of solid steel billets in a vertical press, and the second the descaling of the pierced billets prior to further working. This illustration shows the type of gauge used for measuring the wall thickness of an oxygen-cylinder "hollow" to ensure that it is uniform throughout its length.

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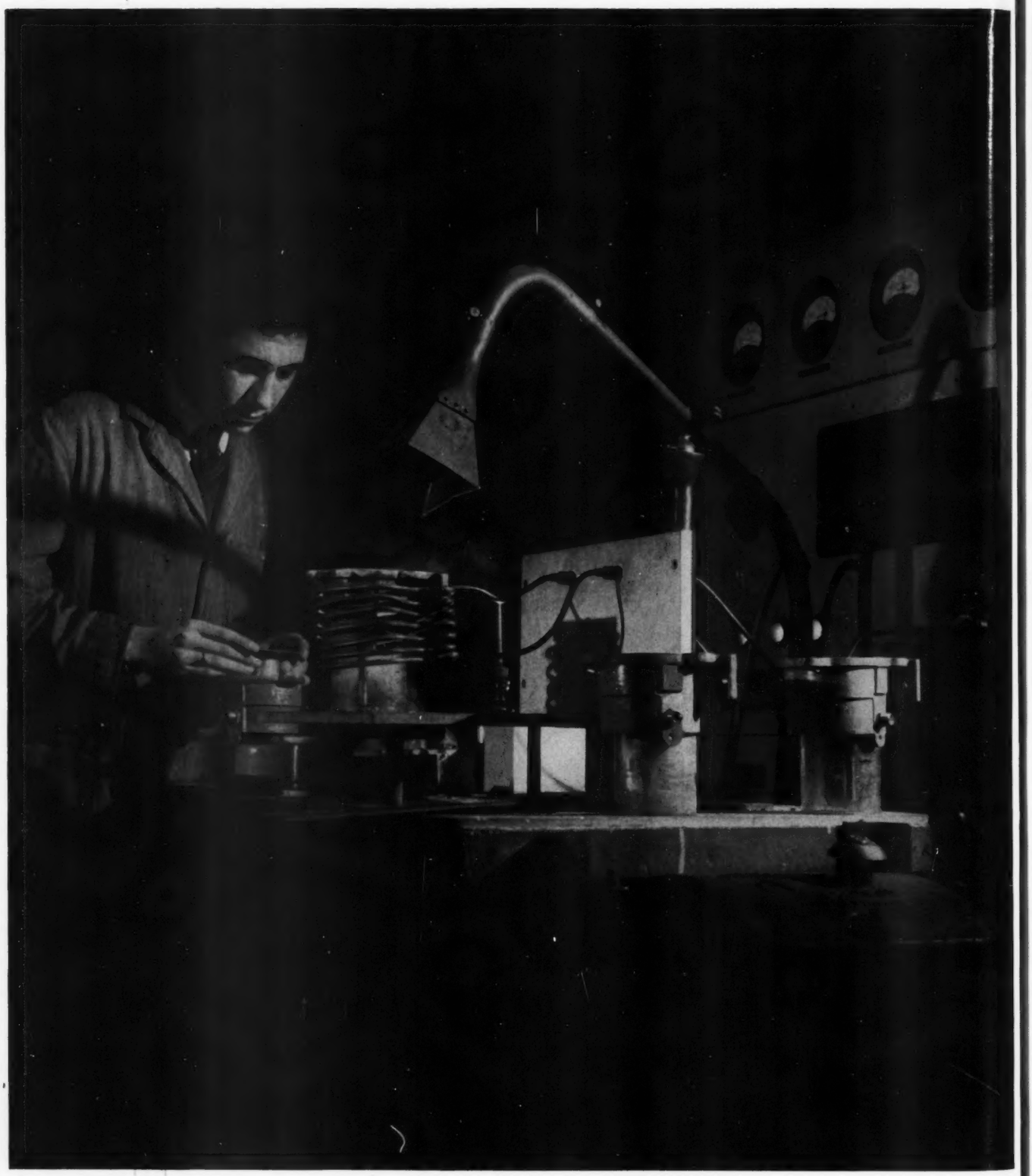

HIGH-FREQUENCY SOLDERING

The use of the technique of soldering by high-frequency induction heating, shown here in laboratory form, has grown steadily during recent years. Complete items can be built up in one operation; the several parts having been assembled with shaped pieces of solder laid in the joints, and all joints having been made at once. This technique can also be conveniently applied to soldering requiring a controlled atmosphere and to mass production lines, as it can be rendered automatic.

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CHECKING CLEARANCES ON A STEAM TURBINE

Checking the clearances between the stationary and moving parts of a steam turbine such as the 60 MW, 1,500 lb. per square inch, 1,050 deg. F. set illustrated here, is an operation requiring considerable skill. The fixed and rotating blades are separated by only a small fraction of an inch, and this distance may vary a little depending on whether the machine is hot or cold. Vibration is another factor which has to be taken into account and care is necessary to ensure that the steam and oil passages are free from scale and dirt before the machine is commissioned.

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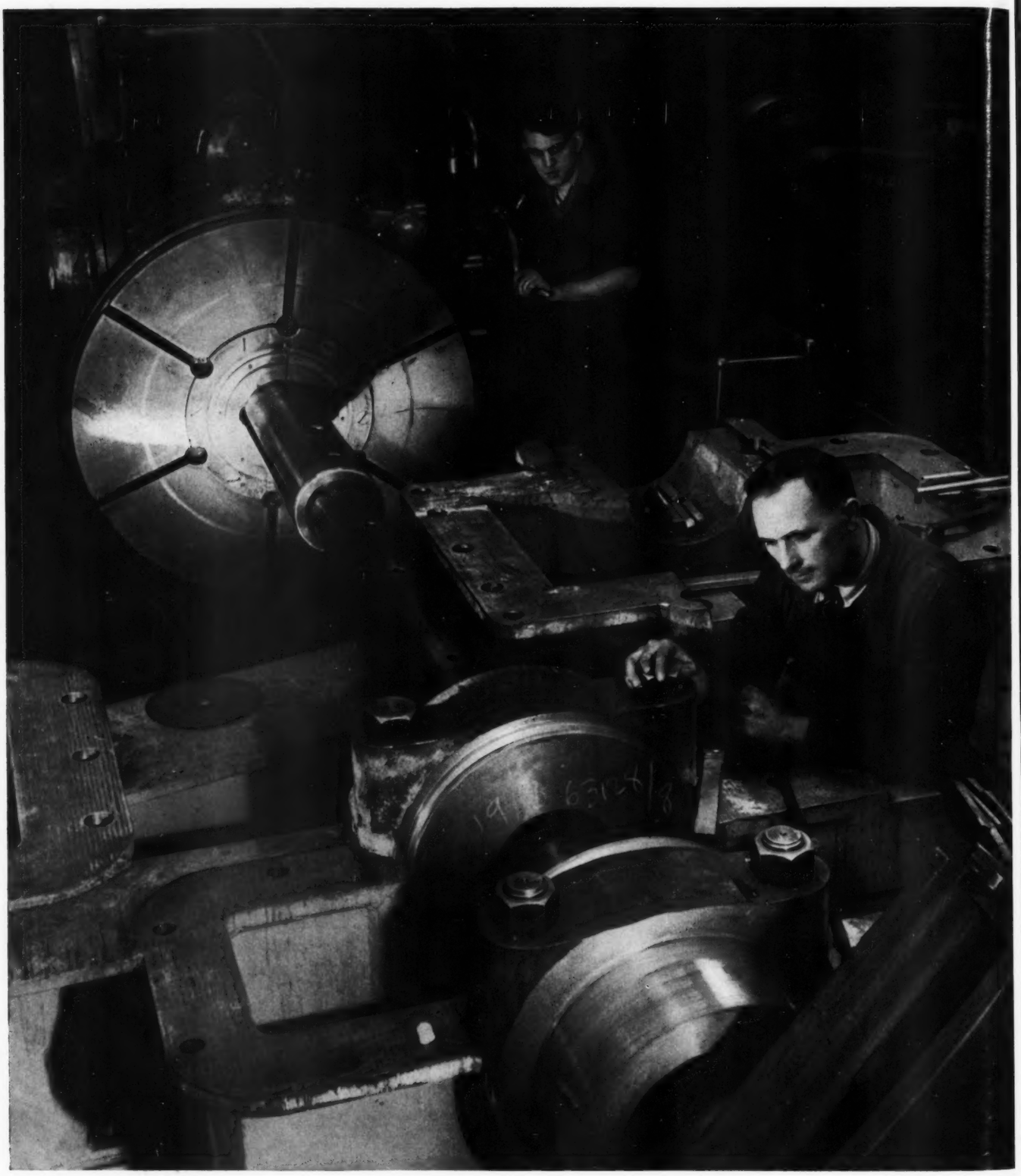

BORING A BLOOMING-MILL DRIVE BOX

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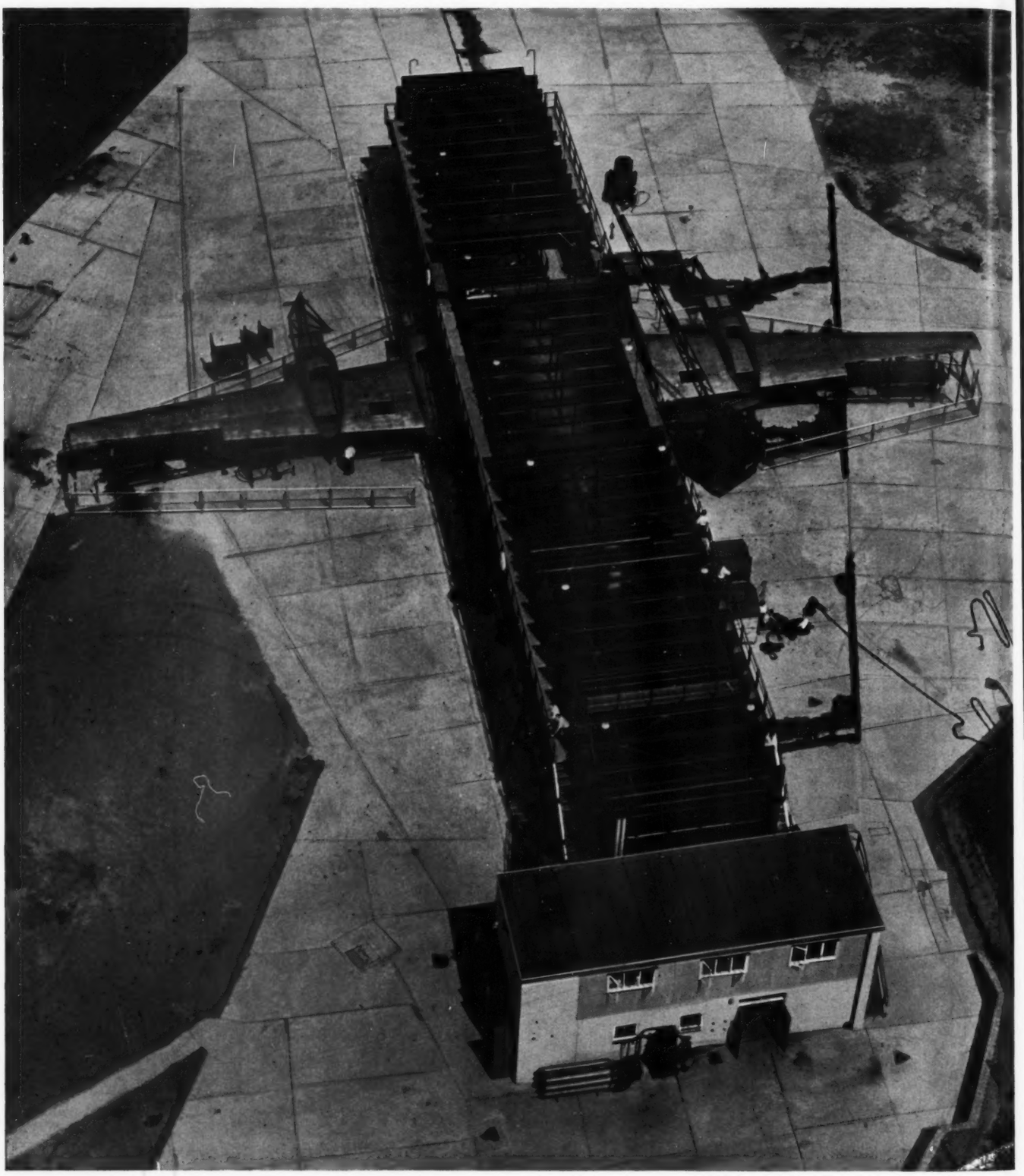

WATER-PRESSURE TESTS ON A BRITANNIA AIRLINER AT FARNBOROUGH

As a result of the structural investigations following the Comet catastrophies, all new British air-liners are required by the Air Registration Board to undergo a repeated loading test simulating the cycles of cabin-pressure loading, gust loading and landing loads on the wing. To avoid risk of explosive disruption of the cabin, the entire fuselage is tested under water pressure. The Britannia, seen here in the water tank at Farnborough, had successfully completed the first phase of the tests. Further tests will probably be carried out on the same aircraft after evaluation of the first phase.

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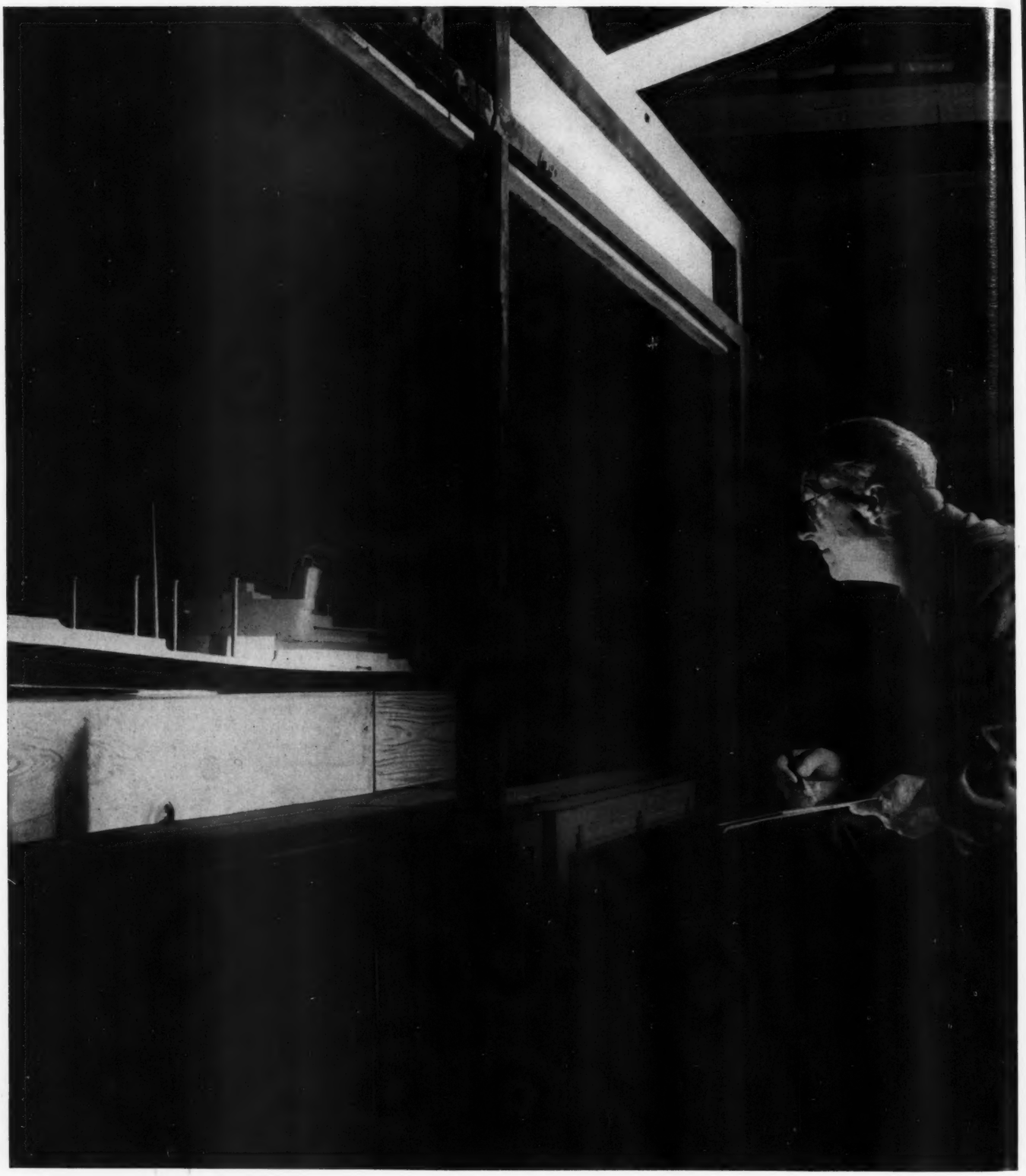

DETERMINING SMOKE DISPERSION FROM A SHIP'S FUNNEL

Early steamships had tall funnels to ensure the proper combustion of the boiler fuel, and these funnels had the additional advantage of being the means of carrying smoke clear of all parts of the ship. With improved methods of combustion a shorter funnel is often used in modern ships, but it creates problems of smoke dispersion. This picture shows a novel type of ship's funnel being tested in a wind tunnel. Such tests indicate how successful new designs may be in carrying the smoke clear of the ship.

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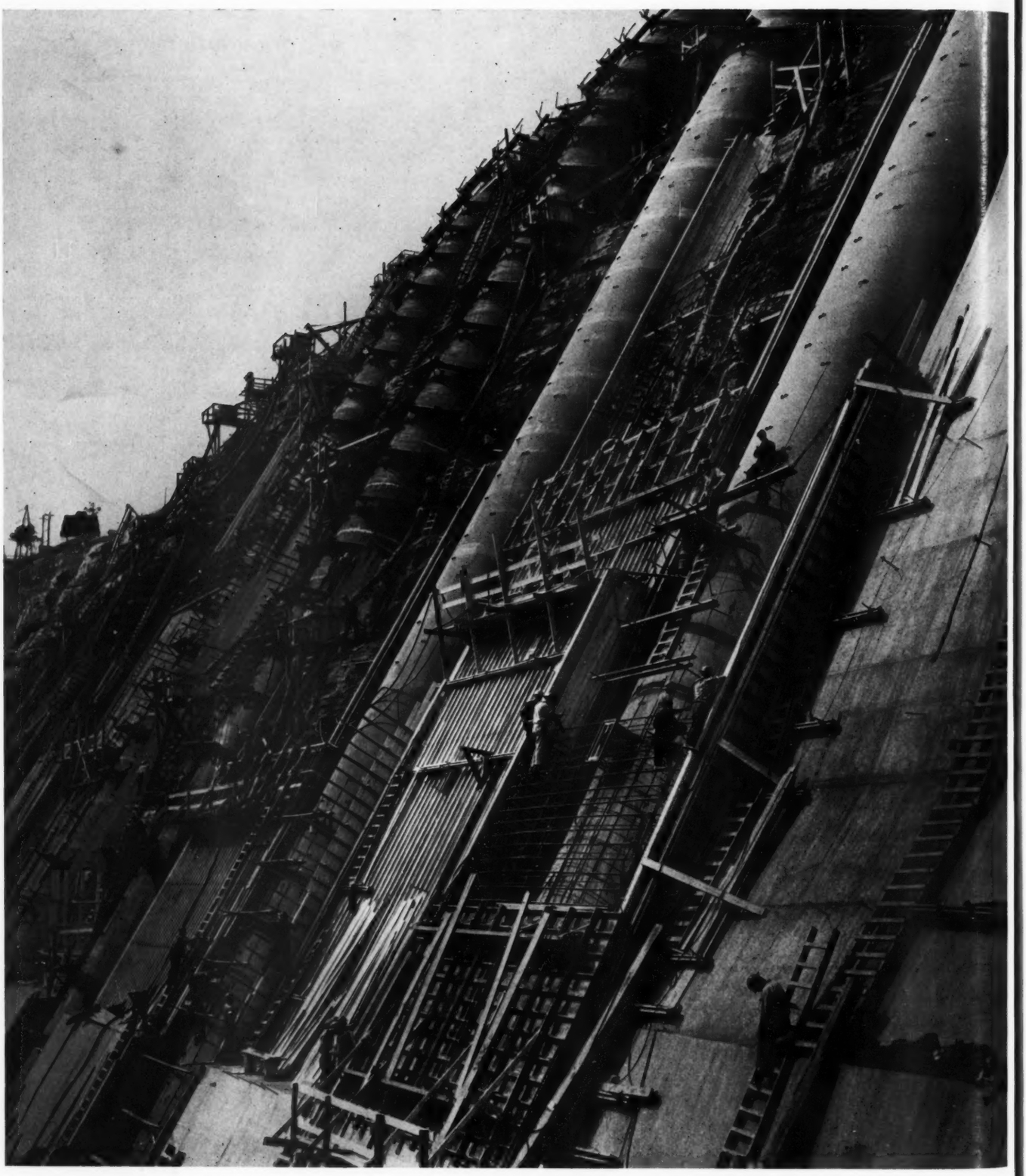

BUILDING PENSTOCKS

The illustration of the penstocks of the Sir Adam Beck-Niagara Generating Station No. 2 for the Hydro-Electric Power Commission of Ontario is the subject of the above illustration. The penstocks, each 492 ft. long and 19 ft. in diameter, are being covered by a concrete blanket, and this work is shown in progress. By mid-summer, 1955, 12 units had been commissioned at the station and provision has been made for the addition of four more 100,000 h.p. units when required. The ultimate capacity of the station will be 1,828,000 h.p.

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ASSEMBLING A STEAM-TURBINE ROTOR

This picture shows the wheel of an intermediate-pressure rotor for a 75 MW steam turbine being fitted on to the shaft. The wheels are forged steel discs, the rims of which are grooved to carry the blades. Before being mounted, they are frequently run at an overspeed for testing purposes. The wheel is first heated and is then lowered over a key which is already in position (though not visible in the illustration). When the wheel cools, the necessary shrink fit is produced between it and the shaft.

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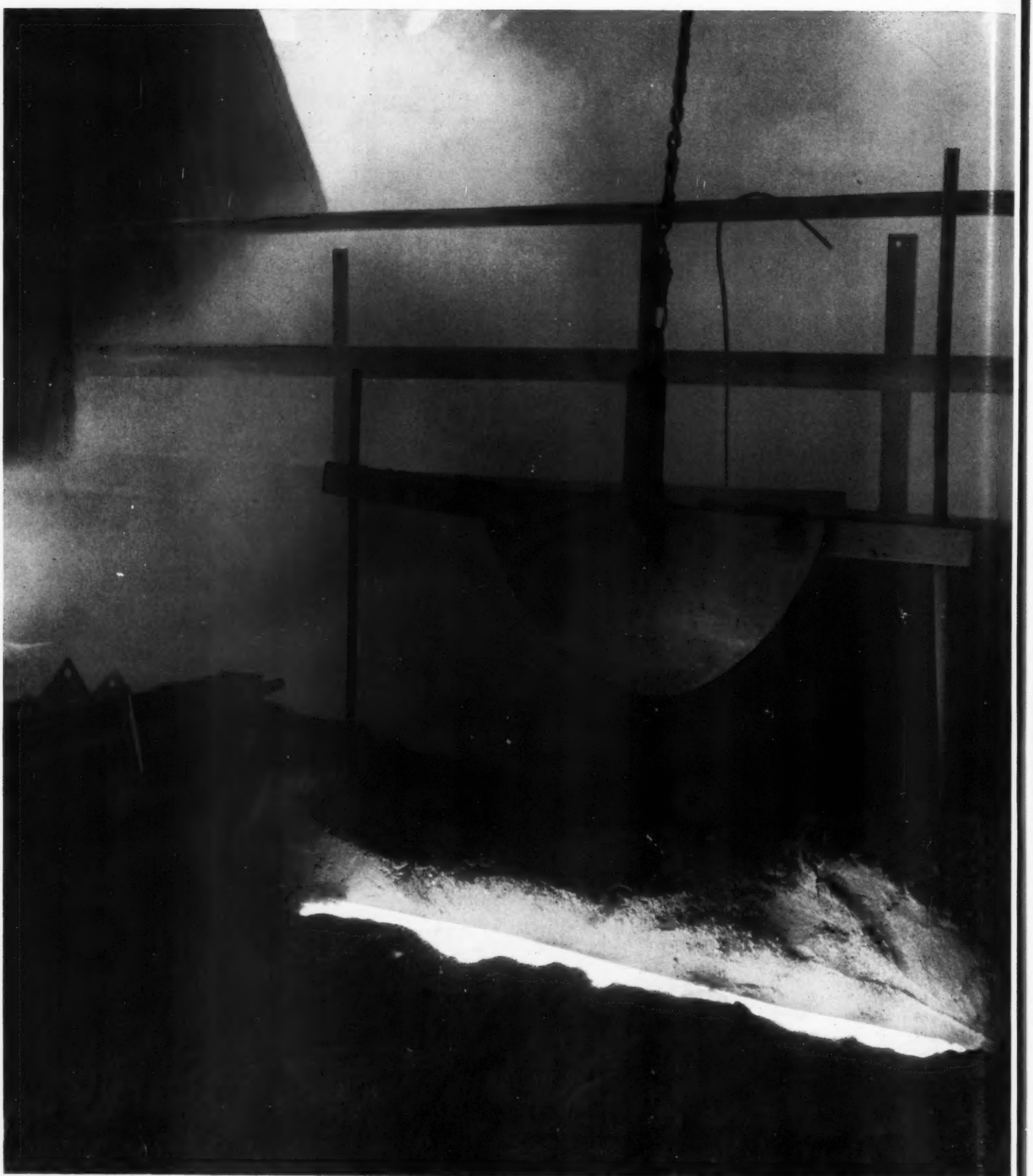

MOLTEN IRON FROM A BLAST FURNACE

When a blast furnace is tapped, the molten iron may be cast into a hot-metal ladle for direct conveyance to the steel melting-shop mixer, or it may be cast into pigs on a sand bed adjoining the blast furnace. This picture shows the liquid iron flowing from the right-hand side of the illustration towards the left, on its way to the pig beds. The spade-like object is a "shut-place" or "shutter," which, on being thrust down into the sand, prevents further iron from entering a side runner, or "sow," when its row of pigs is full.

SEPTEMBER 30

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DROP FORGING A GAS-TURBINE DISC

As a method of manipulating metal, drop forging has the advantage that, with a good design, the fibrous structure of the original billet is retained and moulded to the form of the finished component, so developing a condition contributing towards high strength. This illustration shows the completion of the forging of an air-compressor disc for a gas turbine.

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The Pine Portage generating station of the Hydro-electric Power Commission of Ontario, shown in the above picture under construction, is located 30 miles up the Nipigon River from Lake Superior. The plant, officially opened in 1950, is one of 14 new power sources brought into service by the Commission's expansion programme which was begun at the end of the second World War. Pine Portage generating station to-day has a dependable peak capacity of 153,900 h.p. Together with the output from two older plants, water from the Nipigon River is now used to produce 299,600 h.p.

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H.M.S. ARK ROYAL BOUND FOR THE MEDITERRANEAN

This recent photograph shows H.M.S. Ark Royal in the English Channel on her way to the Mediterranean on a six-months working-up cruise. She is the Royal Navy's most recently commissioned carrier and the first to be fitted with all the post-war developments in flight-deck technique. She is equipped with a 5½ deg. angled deck, port and starboard mirror landing-aids, a deck edge lift (the first to be fitted), in addition to two central lifts, two steam catapults, and improved arrester gear. She has a displacement of 36,800 tons and a peacetime complement of 110 officers, 1,522 ratings, and more than 50 aircraft.

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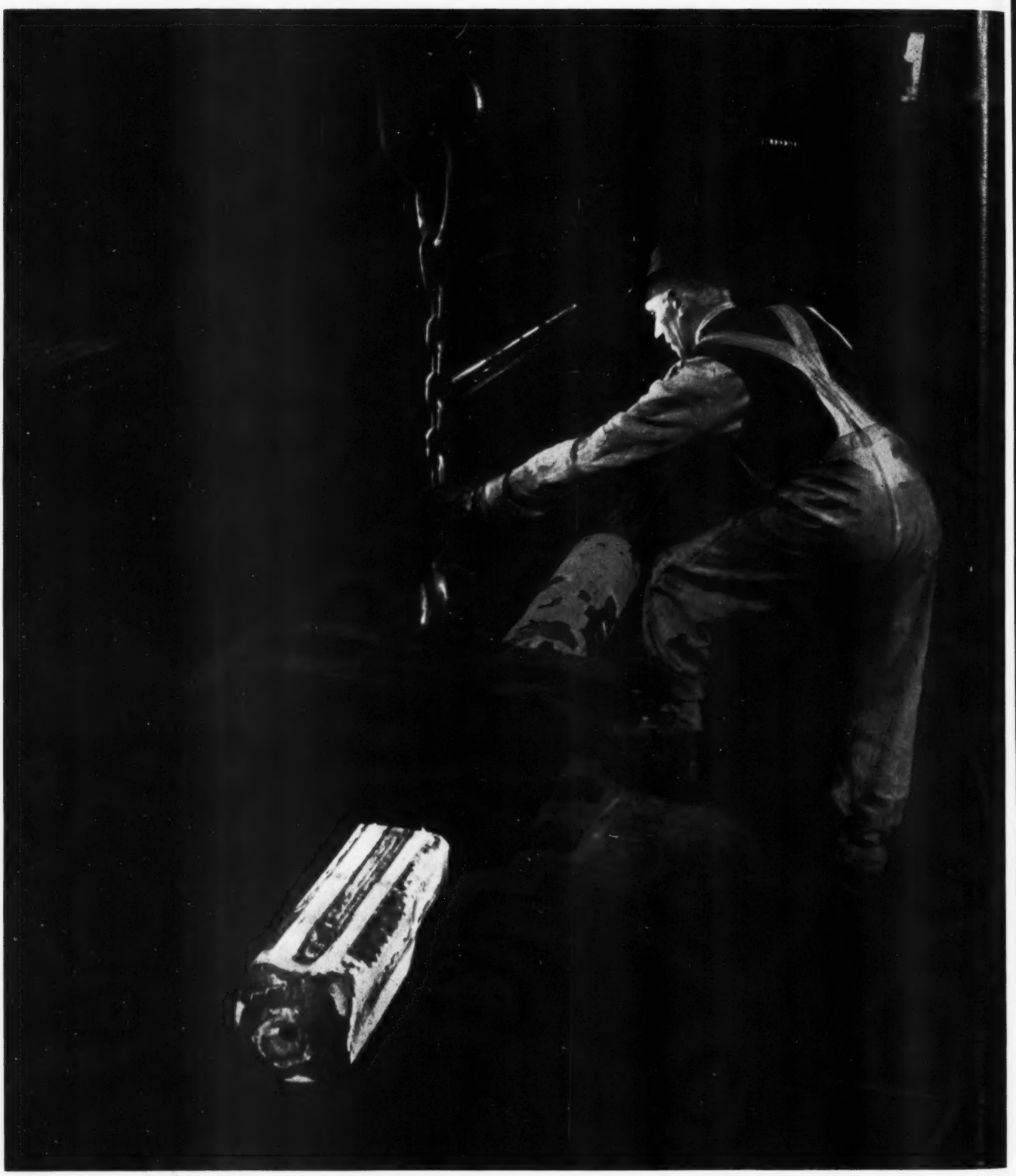

HOT "SQUARING" OF SUPERHEATER HEADER

To make a power-station boiler superheater header, a thick-walled steel tube, having one end almost closed in, is heated to about 1,150 deg. C., and threaded on to a square-section draw bar secured to the moving cross-head of a hydraulic draw bench. On pushing the tube through two special dies the circular shape is changed to a square one. Finally, the tube is removed from the bar by placing a horseshoe-shaped stripper behind the end of the header and backing up against the last die. On reversing the machine, the draw bar is drawn out of the now square-section header.

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A co-ordinatograph is used for examining and measuring air-survey photographs. The photograph under observation is carried on a table mounted on a slide traversing the whole Y axis; the X traverse is obtained with a microscope fitted on a sliding carriage mounted at right-angles to the Y traverse slide. Readings can be taken to 0·01 mm. in either ordinate.

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GREAT WESTERN VALVE DRIVE

No student of locomotive design will need to be told that this photograph shows a characteristic detail of a Great Western Railway locomotive—the drive to one of the outside valves. The engine in this case is No. 4000, *" North Star," of the Castle Class.*

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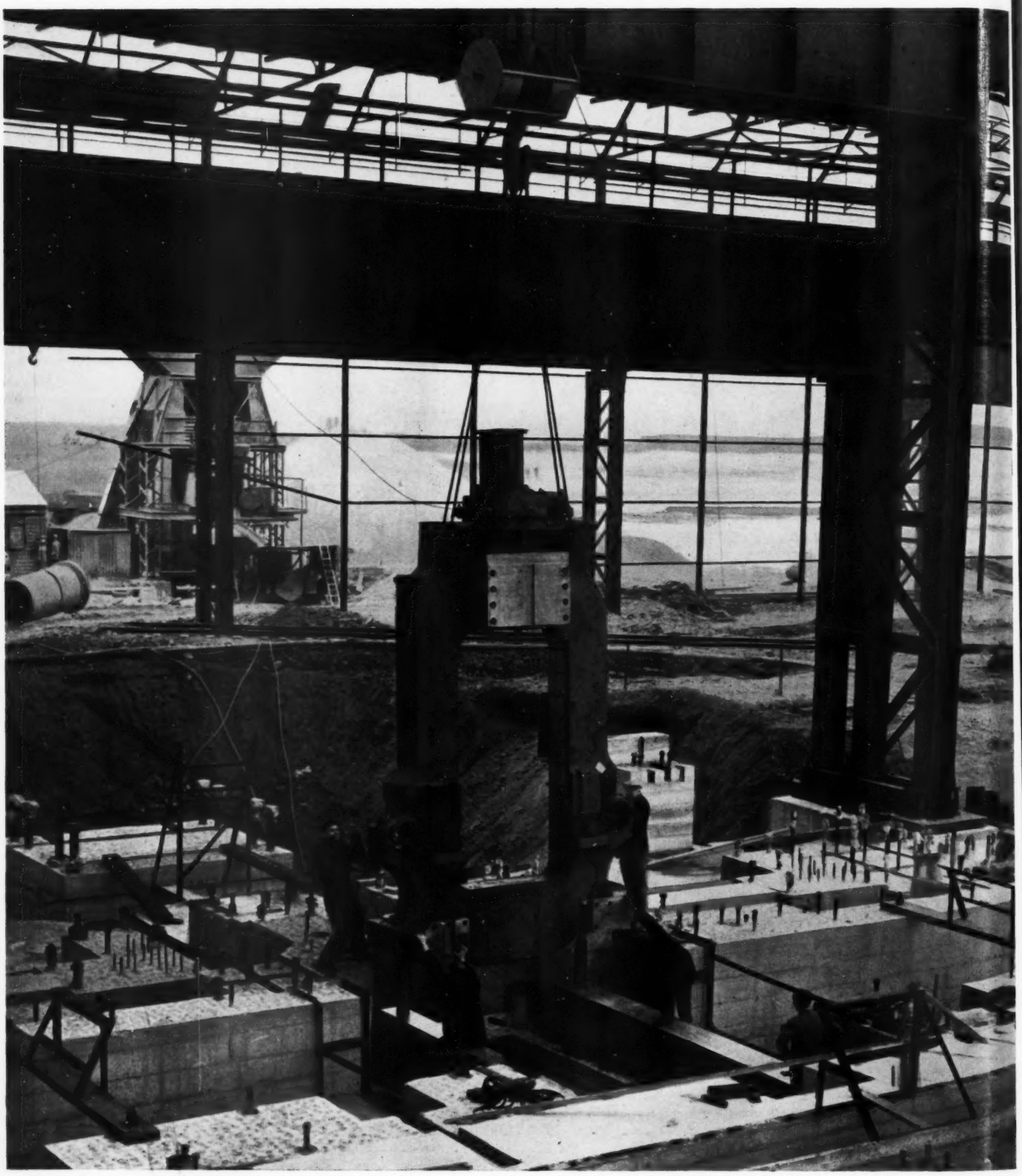

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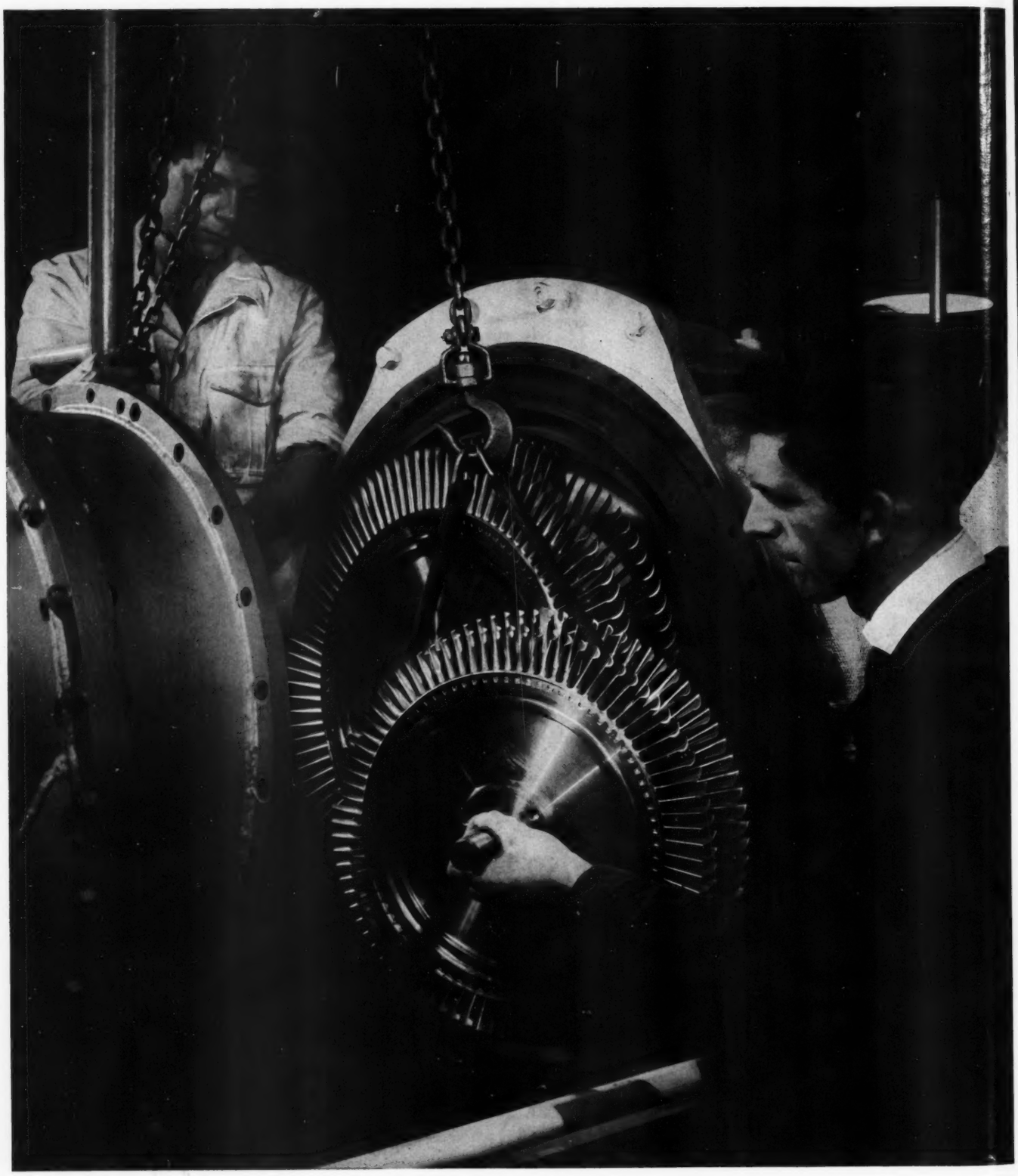

ASSEMBLING A GAS TURBINE

The success of the jet engine led many to suppose that the industrial gas turbine would come into common use shortly after the war. That promise was not fulfilled, but now, ten years later, several firms are making substantial progress in this field, and a number of sets are already in service. This picture shows drop-forged compressor-turbine and power-turbine discs being fitted in a gas turbine for a 900 kW turbo-generator set.

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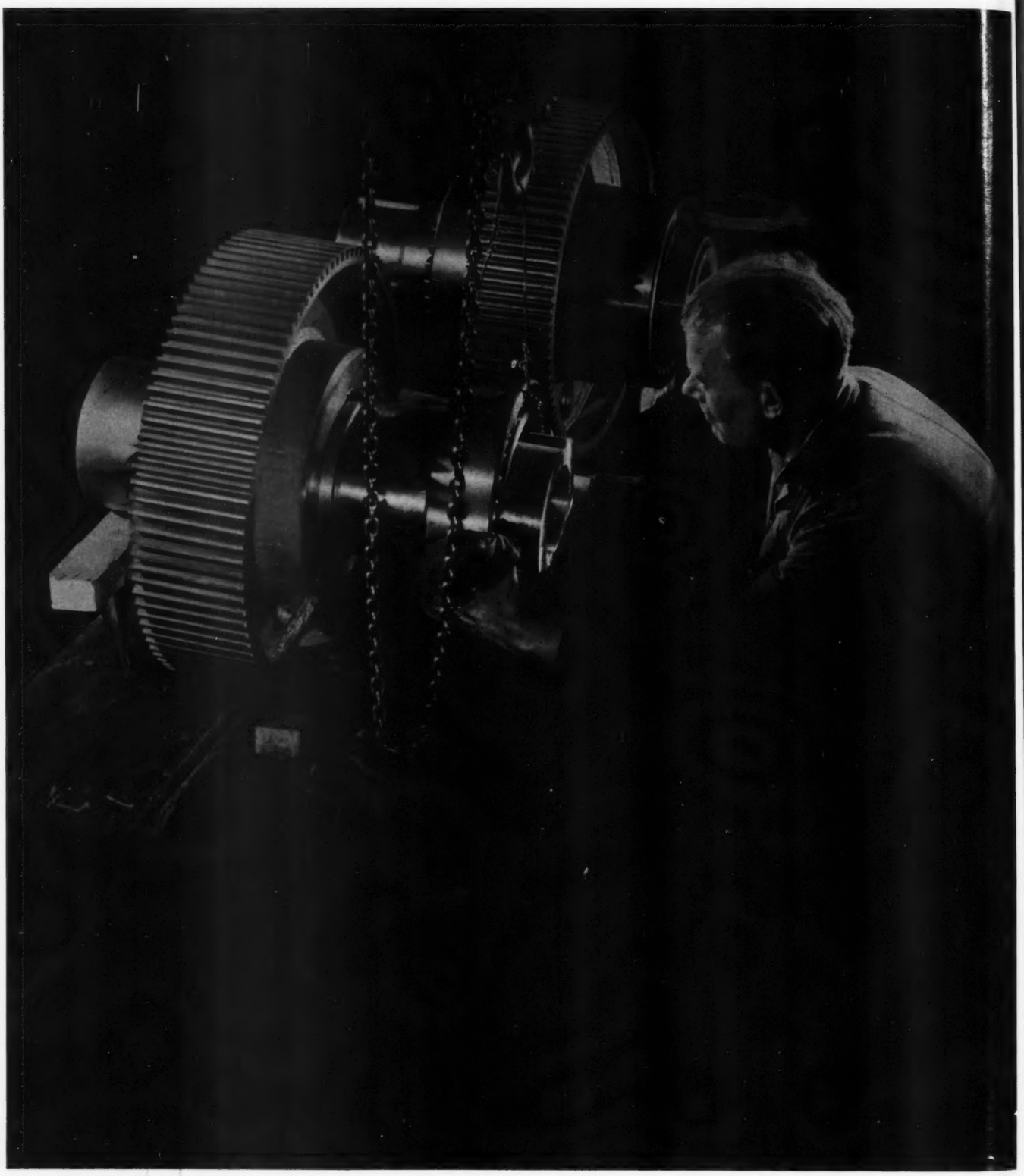

ASSEMBLING A BLOOMING-MILL DRIVE

The severe working conditions to which rolling mills are subject give rise to special problems of design and manufacture. Bearings and gear teeth, in particular, must be capable of withstanding heavy fluctuating loads and, being exposed to shock loading, must be kept free from superficial damage; considerable care must therefore be taken during assembly. The fitter shown in this illustration is assembling roller bearings on the reduction gear shaft of a blooming-mill breast-roller drive.

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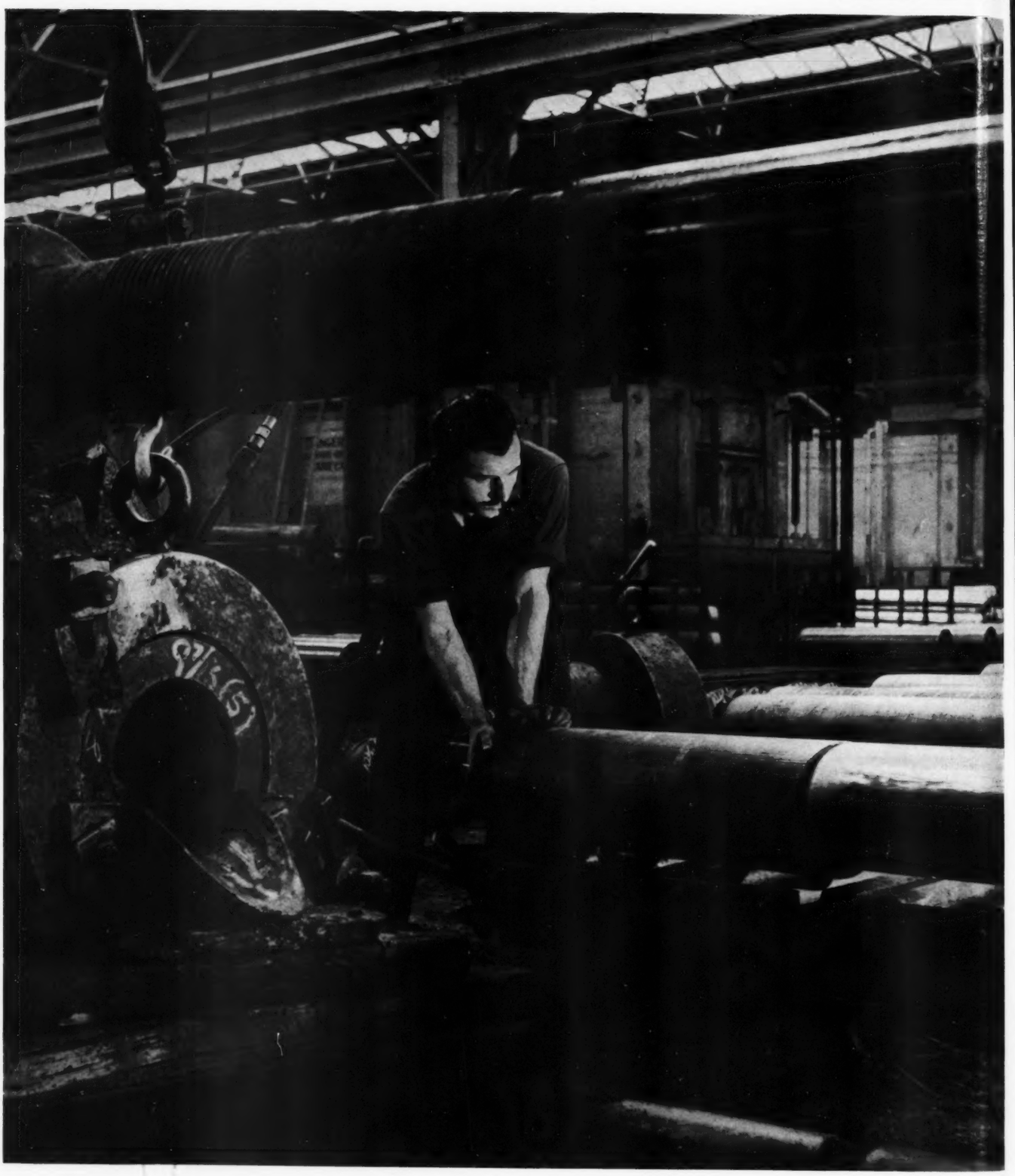

COLD DRAWING A GAS CYLINDER

In the production of seamless steel gas cylinders the final wall thickness is achieved by cold drawing. The photograph shows a gas-cylinder hollow being pushed on to a cold-drawing mandrel prior to being drawn through the die seen on the left. The die is mounted in the fixed cross-head of a horizontal hydraulic press.

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